

Investigating the Motivation for Understanding Enterprise Education: A CaRBS based Exposition

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Objectives:

This study investigates student motivation for undertaking an entrepreneurship education programme and their ultimate employment aspirations via a novel data mining technique. The overriding question considered is what relationship certain motivation characteristics have to students' aspirations, specifically in terms of their intention to be self-employed or employed.

Prior work:

Research continues to support the notion that entrepreneurship plays a key role in creating innovation, wealth and employment. The debate on interventionism has centred on developing an environment in which entrepreneurship can be encouraged and sustained, therein the role of education and training has taken prominence. Many individuals possess attributes and competencies which lend themselves to an entrepreneurial career, studies indicate that entrepreneurship can be encouraged through education and training. Extant studies note educational attainment is correlated to entrepreneurial activity. Much of the research undertaken to date however, focuses on establishing an association between education and entrepreneurship. Despite the fact that it is widely accepted that entrepreneurship makes a significant contribution to an economy, research into the motivations of students to enrol and complete formal enterprise education is limited.

Approach:

The study examined enrolment data of 720 students enrolled on an entrepreneurial education programme, with work statuses of full time, part time or unemployed, and have known aspirations to either employment or self-employment. The Classification and Ranking Belief Simplex (CaRBS) technique is employed in the classification analyses undertaken, which offers an uncertain reasoning based visual approach to the exposition of findings. The notion of uncertain reasoning comes from the utilisation of the Dempster-Shafer theory of evidence methodology in the CaRBS technique. The results presented include, through the classification analysis of different cohorts of students (different statuses of students), with particular emphasis on the influence of the individual motivation characteristics in their association to employment or self employment aspirations. The results are considered in conjunction with certain demographics describing the students (gender and age).

Findings:

The classification findings show the level of contribution of the different motivations to the discernment of students with self employed and employed aspirations. The most contributing aspirations were Start Up, Interests and Qualifications. For these three aspirations, further understanding is given with respect to the gender and ages of the students (in terms of the more association with aspirations towards self-employed or employed). For example, with respect to start-up, the older the unemployed student, the increasing association with employment rather than self-employment career aspirations.

Implications:

The study identifies candidate motivation and the demographic profile for student's undertaking an entrepreneurial education programme. Applicant aspirations should inform course design, pedagogy and its inherent flexibility and recognise the specific needs of certain student groups.

Originality/Value:

The study contributes to the limited literature examining motivations for undertaking entrepreneurship education and categorising motivating factors for study. This study will be of value to both enterprise education providers and researchers.

1 Introduction

This study investigates the underlying motivation for undertaking a distance learning entrepreneurial higher education (HE) programme, utilising a novel non-parametric data mining technique. The overriding question considered here is what relationships certain motivation characteristics have to students' entrepreneurship career aspirations, in terms of their intention to be self-employed or employed. The results were contrasted by student occupational status in terms of being within full time, part time employment or unemployed. Beyond the initial analyses, how levels of influence of motivation characteristics vary in the prescribed relationship when certain demographics describing the student are considered.

The structure of the paper is as follows: in section two, the salient literature is appraised, in section three the student motivation data set is described. In section four, the methodology is described. The results of the undertaken Classification and Ranking Belief Simplex (CaRBS) analysis of the student motivation data set are presented, including the relevance/contribution of the considered motivation characteristics are presented in section five. Further exposition of the relevance of the motivation characteristics is undertaken, taking into consideration certain demographics of the students in section six. Finally, in section seven, conclusions are drawn and directions for future research proposed.

2 Entrepreneurial Education

Research continues to support the notion that entrepreneurial activity plays a pivotal role in creating innovation, wealth, employment and economic growth in industrialised and developing countries (Acs and Audretsch, 2003; Aidis, 2005; McMullen et al., 2008, Benzing et al., 2009). Heinonen and Poikkijoki (2006) describe the key qualities for the effective entrepreneur as creativity, an innovative approach to problem solving, readiness for change and self confidence. The encouragement of entrepreneurial behaviour is essential given the size of the small and medium sized enterprises (SME) community and its contribution to economic prosperity both in the UK and throughout Europe. For example, in the UK, SMEs account for 99.8% of all enterprises and 52.4% of employment. Similarly, Europe's population of SMEs accounts for 99.8% of all enterprises and 66.2% of employment (Small Business Service, 2006).

Over the past decade there has been a significant global increase in entrepreneurship education programmes aimed at augmenting entrepreneurial activity at all levels (Fayolle et al., 2006; Hamidi et al., 2008). Young (1997) previously defined entrepreneurial education as the structured formal conveyance of entrepreneurial education. This increased demand has been fuelled by four key drivers of change including global, societal, organisation and individual characteristics (Henry et al., 2005). Globally, the reduction in, global trade barriers, information technology and telecommunications progression and enhancement of transportation infrastructure, have provided new opportunities and increased business uncertainty and complexity. At a societal level, factors such as privatisation, deregulation, increasing environmental impacts and catering for the rights of minority groups of the individual have increased business process complexity. At an organisational level, decentralisation, downsizing, business process reengineering, increased strategic alliances and mergers and workplace flexibility have impacted to increase business uncertainty. Lastly, Henry et al., (2005) notes the impact on the individual as being faced with an increased variety of employment opportunities and having to undertake a diversity of roles during their employment career.

Much of the debate on interventionism has centred on developing an environment in which entrepreneurship can be encouraged and sustained (Gilbert et al., 2004). In conclusion, Matlay (2006) suggests that entrepreneurship education has climbed the political agenda within industrialised and developing economies as a means of encouraging both economic growth and employment. Thus the reality is that most current HE students are likely to be employed within the SME sector at some future point and therefore must be equipped with the appropriate knowledge and skills to prosper in such an environment (Anderson and Jack, 2008).

Within this discussion the role of education and training has taken prominence (Jones-Evans et al., 2006). This is based on the premise that it is possible to provide individuals with the requisite skills and knowledge required to start and develop a new venture (Gorman et al., 1997; Kuratko, 2005). Whilst many individuals already possess distinct attributes and competencies which lend themselves to an entrepreneurial career, recent studies suggest that entrepreneurship can be encouraged through education and training (Hytti and O'Gorman, 2004). Zeithaml and Rice (1987), Hills (1988), Solomon et al., (2002) in the USA and Johannisson et al., (1998) within Europe, suggested that the primary goal of such programmes was to increase student awareness of entrepreneurship as a process and thereafter increase awareness of the attainability of an entrepreneurial career. Several prior studies have associated successful completion of

entrepreneurial education with students undertaking business start up activities thereafter (Kolvereid and Moen, 1997; Osborne et al., 2000; Dumas, 2001; McLarty, 2005; Dickson et al., 2008). Previous research by Robinson and Sexton (1994), Delmar and Davidsson (2000), Brooksbank and Jones-Evans (2005) found that educational attainment was positively correlated to entrepreneurial activity. This evidence has provided the impetus for a dramatic increase in the number of entrepreneurship courses being offered by HE institutions (Katz, 2003). Many of these courses however, have been criticised as only providing a traditional, corporatist approach to enterprise education which often failed to prepare nascent entrepreneurs for successful business start-up (Gibb, 1993; Gibb, 2005).

Much of the extant research undertaken focuses on establishing an association between education and entrepreneurship. These studies have been successful in establishing a link between education attainment and entrepreneurial activity and advocating the role that education plays in promoting entrepreneurship as a viable career option (Rosa, 2003). Creating and sustaining a new enterprise requires adequate motivation to surmount the hardships and frustrations involved (Hisrich and Peters, 1998; Kuratko and Hodgetts, 2001). Hence, the motivation to engage in entrepreneurial activity is a profound issue. Despite the fact that it is widely accepted that entrepreneurship makes a significant contribution to economic prosperity, research examining the underpinning motivations of students to enrol and complete formal enterprise education is limited (Segal et al., 2005).

3 Student Motivation and Entrepreneurship

The Oxford Dictionary Thesaurus & Wordpower Guide (2001) defines the term 'motivation' as: *'the reason or reasons behind one's actions or behaviour'*. McClelland (1961) and Miner (1993) identified that entrepreneurs have a high need for achievement characterised by a desire to succeed and excel which is more attainable within an entrepreneurial career choice. Contrastingly, McClelland and Winter (1969) found that managers had a tendency to be higher in need for power and lower in need for achievement. Watson et al., (1998) argued that the motivation to start up a small business was influenced by characteristics such as work experience, personality, family environment and societal norms. Porter and Lawler (1968) suggested a model that outlined the process of entrepreneurial motivation within which the four main characteristics that influenced the decision of an individual to start up a business were personal values, characteristics, situation and the status of the business environment itself. Gilad and Levine (1986) proposed several 'push' and 'pull' characteristics which could be utilised to classify the motivations underpinning small business start-up. Push characteristics related to negative forces such as difficulties in finding employment, job dissatisfaction, inadequate remuneration, whereas pull characteristics included independence, wealth and personal fulfilment were considered positive motivational influences (Chell, 2001; Hisrich and Peters, 1998).

In high-income countries, there were four times more adults that engaged in entrepreneurial activities through opportunity than necessity (Bosma and Harding, 2006). Moreover, Watson et al., (1998) concluded that pull characteristics such as independence, being one's own boss, using creative skills, doing enjoyable work and wealth creation, were more important than the push characteristics such as redundancy, frustration with employers and need to earn a reasonable living. Segal et al., (2005) however, contended that displaced workers did not necessarily pursue an entrepreneurial option unless other influences were evident. Roberts (1991) examining nascent entrepreneurship in the high technology sector found the majority of respondents did not consider personal wealth creation as a primary motivator for self employment. Entrepreneurial drivers including a need to achieve, a desire for independence and dissatisfaction with current employment, were often cited as the primary reasons associated with small business start-up.

Segal et al., (2005) determined that motivations of undergraduate business students to embark on entrepreneurial careers was related to an individual's tolerance for risk, whilst Chell (2001) argued that entrepreneurial activity was underpinned by the need for achievement, independence and power. Galloway and Brown (2002) found that the rate of immediate start-ups by graduates was relatively low and suggested that the lack of motivation was likely to be due to personal debt, lack of collateral, limited industrial experience and alternative priorities. Segal et al., (2005) argued that graduates were less influenced by push characteristics due to limited employment experience. Young (1997) outlined several reasons as to why university students were motivated to study entrepreneurship. These motivational characteristics included: independence, the acquisition of skills and knowledge to enhance career progression and gaining an adjunct competitive advantage in an independent professional career (e.g. dentist, accountant). In addition, some students regarded such skills and knowledge as a buffer against possible threats to an intended career path (Galloway and Brown, 2002).

Therefore, it was important to explore the motivational characteristics which underpinned students decision to undertake an entrepreneurial education programme and their career aspirations

thereafter. As previously discussed, a significant literature exists examining motivations for undertaking an entrepreneurial career (Galloway and Brown, 2002; Segal et al., 2005; Taormina and Lao, 2007). By contrast only a limited literature exists regarding the motivations related to undertaking formal entrepreneurial education (see Young, 1997; Galloway and Brown, 2002). This literature is considered in the following section.

3.1 Student Motivations for Entrepreneurship Education

The literature allowed the identification of motivational characteristics underpinning the decision to undertake formal entrepreneurial education: -

- i) Desire to undertake a business start up (Start Up)
- ii) Desire to acquire management experience (Management)
- iii) Desire to achieve business growth (Business Growth)
- iv) Desire to increase confidence in the option of an entrepreneurial career (Confidence)
- v) Desire to develop interest in the subject matter (Interests)
- vi) Desire to acquire entrepreneurial education related qualifications (Qualifications).

Each of these motivational characteristics was considered in turn in light of the prior literature which informs the following debate and subsequent CaRBS analyses.

Start Up (StrtUp)

Young (1997) suggests that students undertake entrepreneurial related programmes to provide the knowledge required for the business start up process. Galloway and Brown (2002) posited that students undertook entrepreneurial education to enhance their prospects of undertaking an entrepreneurial start up at some future point. Specifically, their study noted that 78% of students identified intent to start a business, of which 19% would enable this process within five years, 38% between five and ten years and 43% after ten years. Furthermore, it was apparent that entrepreneurship education students were prepared to delay their proposed business start up for a significant time period, a trend noted previously in Hayward and Sundes (1997).

Management (Mngmnt)

Ineffective managerial competencies have long been associated with small business failure (Walker et al., 2007). Anderson and Jack (2008) identify that individuals are attracted to the discipline of entrepreneurial education by the opportunity of personal development and an adaptable skills base. Specifically, Galloway et al., (2005) and Cooper et al., (2004) noted that students seek education that provides them with transferable skills including managerial competencies. Whilst Chrisman and McMullan (2004) noted entrepreneurial education study enabled improved managerial competency in areas such as sales and management of employees.

Business Growth (Grwth)

The prior knowledge informs us that entrepreneurship enhances business growth (Acs, 2003; Audretsch and Keilbach, 2006; Praag and Versloot, 2007). However, van Stel and Storey (2004) suggests that entrepreneurial activity does not necessarily stimulate business growth for several reasons (Hessels et al., 2008). Firstly, high growth enterprises contributed more to economic growth than micro enterprises in the start up phase (Wong et al., 2005). Secondly, a large proportion of Owner/Managers undertaking business start up had no growth aspirations. Hay and Kamshad (1994) noted that such enterprises often remained constant in size as their existence provided lifestyle advantages for Owner/Managers. Such enterprises typically had minimal ambition beyond maintaining their current operations and providing their products and services within existing markets (Levy et al., 2005). Thirdly, Hessels et al., (2008) noted that there is a deficiency of research exploring the diversity of entrepreneurs with a growth perspective. Therefore, it is essential that entrepreneurial education enables existing and nascent entrepreneurs to pursue an entrepreneurial career with a growth perspective.

Confidence (Cnfdnc)

The current interest in entrepreneurship is apparent by its high visibility within the UK media, through programmes such as “Dragons Den” and the “Apprentice” and government policies to encourage entrepreneurial activity. Within the UK, increased provision and focus upon entrepreneurial education through primary, secondary, further and HE increases individual entrepreneurial orientation (Frank et al., 2005) and the confidence on the attainability of such a career. Thus entrepreneurial education

must encourage new entrepreneurial careers and increase the confidence of the existing entrepreneurial population to further develop their activities.

Interests (Intrst)

Jones-Evans et al., (2008) noted that nascent entrepreneurs and Owner/Managers pursue an entrepreneurial career to develop an idea or pursue a hobby. Entrepreneurship education provides a focus for developing entrepreneurial capability and interest in the subject matter. An entrepreneurial education programme should provide the student with the ability to generate new venture ideas (DeTienne and Chandler, 2004; Politis, 2005) and refine and develop existing proposals.

Qualifications (Qlfctns)

Prior research informs us that SME Owner/Managers have lower formal educational levels in comparison to their counterparts within larger businesses and participate in fewer training activities (Bartram, 2005). Contrastingly, Robinson and Sexton (1994) suggest that SME Owner/Managers are more highly educated than the general public, a statistic supported by Muir et al., (2001) based on a study of female entrepreneurs. Schwarz et al., (2009) noted that well educated entrepreneurs were more likely to grow their enterprises than lesser qualified counterparts. Moreover the importance of highly educated Owner/Managers for the survival and growth of business start-ups has long been recognised (Cooper et al., 1994; Kennedy and Drennan, 2001). Therefore an educated and skilled labour force is considered essential for the growth of the SME sector within the global economy (Walker et al., 2007). Therefore, it is important to assess the importance the individual student places on the attainment of entrepreneurial related qualification as a mechanism to develop their entrepreneurial competencies.

3.2 Student Employment Aspirations

In addition to motivation characteristics for undertaking entrepreneurial education, it was apparent that there were future student career aspirations for both self employment and employment opportunities post programme of study. McMullen et al. (2008) identified that the motivation to become an entrepreneur is closely associated with levels of government related economic freedom. As a consequence, it is possible to identify opportunity motivated entrepreneurship (OME) and necessity motivated entrepreneurial (NME) activity. They identify OME as when individual/s undertake a business start up having recognised a business opportunity and are compelled into the career move by the attractiveness of the opportunity. NME by contrast, is a last resort, whereby individuals are driven towards an entrepreneurial career choice through lack of an alternative option (McMullen et al., 2008). The significance of these aspirations is now considered: -

Self-employed (SE)

Several studies have recognised that entrepreneurship education can promote entrepreneurship as a potential alternative career option for graduates post graduation and encourage favourable attitudes towards entrepreneurship (Katz, 1991; Kolvereid and Moen, 1997; Young, 1997; Alvarez and Jung, 2003; Jones et al., 2008). There remains an ongoing challenge, however, to inform and convince undergraduate students that a self employment business start-up is a viable alternative career to that of employment (Carayannis et al., 2003). Schwarz et al, (2009) identifies three underlying drivers for self employment namely:

- i) Educated entrepreneurs are expected to create business start-ups that grow more effectively than their lesser educated equivalents.
- ii) Increased global competition has reduced the attractiveness and opportunities for wage employment in larger organisations.
- iii) Increase in graduate unemployment.

They further note that it is not known whether environment or individual characteristics drive students' career decisions toward self-employment. Therefore, this study explores the relationships between motivational characteristics for entrepreneurship education and career aspirations towards self-employment of undergraduate students pursuing a degree in entrepreneurship.

Employed (E)

Seeking appropriate waged employment has long been regarded as the optimum graduate ambition post study. However, as noted by Schwarz et al., (2009), such options have been minimized by the global recession. Tan et al., (1995) proposed that students may be attracted to entrepreneurial


learning as an alternative career opportunity in times of economic recession. Thus, intention to undertake both entrepreneurial activity and entrepreneurial education could be heavily influenced by economic climate, which is particularly relevant in the current global recession. Alternatively, waged employment is often regarded as a pre-cursor to future entrepreneurial activity to acquire the relevant qualities, skills and knowledge for future success. Young (1997) noted that students might study entrepreneurship as they wish to acquire knowledge that would be beneficial to their career in a larger organisation. Moreover, Carter (1998) found in her study of alumni perceptions of entrepreneurship education in HE, that many '*believed it was important to gain some work experience prior to start-up as it not only gave them detailed sectoral knowledge, it also provided a network of business contacts and the appropriate finance to start-up.*' Thus, it seems that the motivations of students to achieve employment having studied entrepreneurial education vary significantly and warrant further investigation.

4 Methodology

The research utilised a multi-method approach to data collection for the purposes of triangulation and to take advantage of the respective qualities of quantitative research instrumentation (Mingers, 2001). The first stage involved the analysis of student enrolment data to identify age, gender and background characteristics such as employment status, qualifications and ethnic origin. The second stage of the research involved semi-structured interviews with a sample of students undertaking the course to discover why students had chosen to embark on an undergraduate enterprise degree. The sample reflected the age and gender differences identified in the enrolment data. The rationale for analysing these differences was based on the findings of previous studies. For example, it is widely acknowledged that gender has a significant effect upon nascent entrepreneurship (Brush, 1992; Minniti et al., 2005) and that there is considerable variation in entrepreneurial activity between different age groups (Davidsson and Honing, 2003; Reynolds et al., 2003). Allen et al., (2007) identified levels of female entrepreneurial activity in the UK (10.73%) were found to be inferior (-7.72%) in both early stage (male 11.98%, female 7.25%, -3.73%) and established enterprises (male 6.47%, female 3.48%, -2.99%) to that of male business-owners (18.45%). For the purposes of this study, GEM age groupings were utilised (Bosma and Harding, 2006).

Prior to the interview, students were provided with an interview guide asking them to consider why they had selected the course and what they considered to be the primary motivations behind the decision to study an undergraduate enterprise programme. Interviews were either conducted in person or by telephone. The average length of an interview was thirty minutes. During the interview students were asked to complete a structured research instrument employing five-point Likert arrays to enable statistical and comparative analysis (see Table 1).

Table 1: Likert scale employed within Research Instrument

1	2	3	4	5
Not	Limited	Contributory	Important	Most
Important	Importance			Important
Attitude				Positive
				Attitude

The Likert arrays were designed to assess the importance of each of the following motivational characteristics underpinning their desire to undertake an entrepreneurship programme, identified previously in section 3.1). In addition students were asked to identify through the selection of one category whether they wished to pursue a career in employment or self employment post graduation. All interviews were recorded and later transcribed. Further, respondents were asked to confirm that the transcription represented a true reflection of the interview (Packham et al., 2006). The study examined data for 720 students enrolled on the course between September 2002 and June 2006.

The non-parametric analysis technique utilised in this study is the CaRBS technique, recently introduced in Beynon (2005a; 2005b). Since its introduction the CaRBS technique has been applied in the areas of; public administration (Beynon and Kitchener, 2005), medicine (Beynon et al., 2006; Jones et al., 2006), animal biology (Beynon and Buchanan, 2004) and E-learning (Jones and Beynon,

2007). The rudiments of CaRBS is based on Dempster-Shafer theory (Dempster, 1967; Shafer, 1976), as such it operates in the environment of uncertain reasoning. That is, there is the allowance for an *a priori* considered non-certainty of the association of motivation characteristics to the student aspiration problem considered.

A total of 720 students enrolled onto the undergraduate enterprise programme during the period of investigation of which 383 (53%) were female and 337 male (47%), with an age range from 19 to 64 years old. The mean age for the cohort was 37.37 with a marginal difference in the gender mean ages (see Table 2).

Table 2: Student Enrolment by Gender 2002-06

	Males $N_1 = 337$	Females $N_2 = 383$	Combined $N_T = 720$
Mean (M)	38.31	36.27	37.37
Median (Mdn)	37	35	36
Standard Dev. (SD)	11.22	10.52	10.94

Further, using the age ranges, 18-24 (later labelled 1), 25-34 (2), 35-44 (3), 45-54 (4) and 55-64 (5), Figure 1 presents a breakdown of the percentage of students (from the 720), in each of these age groups.

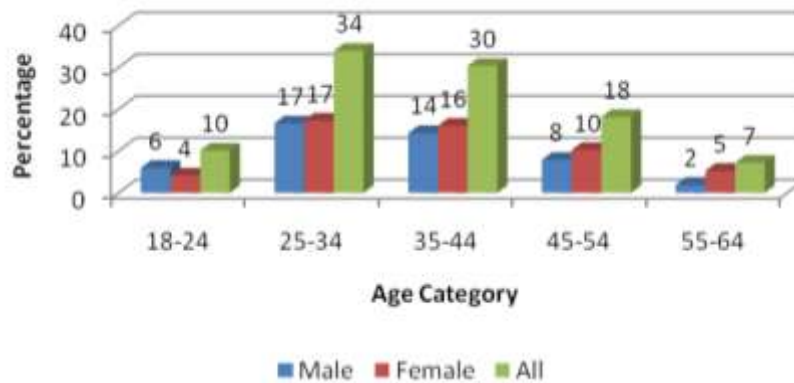


Figure 1 profiles the survey respondents by gender and age which reveals gender representation in each age category.

5 Findings - CaRBS Analysis of Student Motivation Data Set

The contention in this study is that the use of this technique offers a number of advantages over the employment of other traditional techniques, such as logistic regression. First, by drawing on all the available information to model student aspirations, evidence-based approaches can accommodate outliers within datasets without needing to fit them to a Gaussian distribution by weighting them or excluding them from the analysis altogether. Second, because evidence-based approaches are data-driven they are also able to reveal the full range of linear and non-linear relationships that might be present within a dataset.

Throughout the study there is emphasis on the visual representation of results, including final classification of students and relevance and contribution of the motivation characteristics describing the students. This study has the twin goals of offering an initial investigation of motivation-aspiration analysis of differences in students and the first practical exposition of the CaRBS technique in a motivation-questionnaire based analysis. Accompanying the main paper is an appendix that contains the technical details of the CaRBS technique, and should be referred to for explanations of technical terms used in the description of the modelling results.

The CaRBS based analysis undertaken here is the modelling of the students' motivation characteristics in re-creating their expressed aspirations, labelled here as either, employment (E defined here the hypothesis x - see Appendix A) or self-employment (SE defined not-the-hypothesis $\neg x$). The configured CaRBS system produces a final aspiration body of evidence (BOE) for each student, represented as a simplex coordinate in a simplex plot (the standard classification domain employed with CaRBS), made up of an equilateral triangle, whose base vertices in this case are the two aspirations {SE} and {E}, and the top vertex represents ignorance (termed here as {E, SE}).

Emphasis here is on the relevance/contribution of the individual motivation characteristics in this modelling process (configuring a CaRBS system). That is, in general, how discerning were the individual responses from the students to the respective motivation questions, when they were employed to segment the known aspirations of the students, see Figure 2 (With a grey shaded sub-region of the simplex plot domain shown - see the small full simplex plot domain for reference).

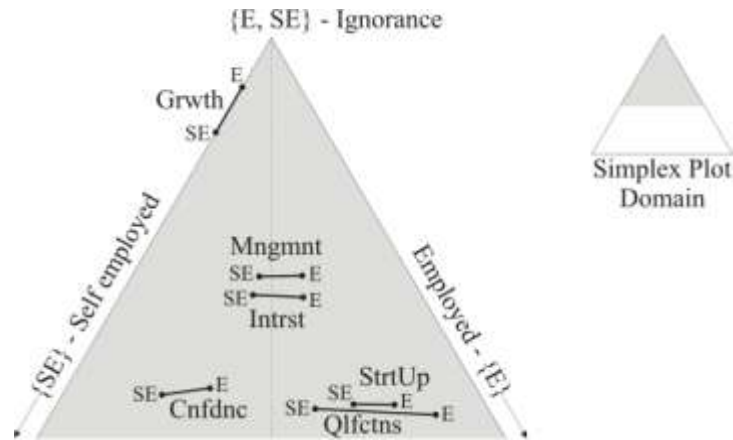


Figure 2: Simplex plot based elucidation of relevance of motivations to segmentation of self-employment (SE) and employment (E) aspirations of students

In Figure 2, for each of the known aspirations, SE (self-employed) and E (employed), the simplex coordinate forms of the respective average motivation BOEs are presented (see Appendix A). The lines joining the pairs of SE and E simplex coordinates are to allow comparisons between the segmenting strengths of the motivation characteristics. There are two positional issues to consider when viewing the results in Figure 2 (and considered in conjunction with each other);

- i) Vertical distance from the {E, SE} vertex: The further distance away (down) from the {E, SE} vertex the less ignorance there is associated with the evidence from that motivation characteristic in the overall segmentation of students' aspirations (so more relevance).
- ii) Horizontal distance between SE (Self-employment) and E (Employment) labelled simplex coordinates associated with a motivation characteristic: The horizontal distance between the two points considers the level of ambiguity of the responses made between the groups of differently aspiring students (more distance between them infers less ambiguity).

Based on these two positional traits, there are three groups, in contribution terms, of motivation characteristics shown (based on distance down the simplex plot sub-domain). The most relevant are the motivation characteristics, Start-Up (StrtUp), Confidence (Cnfdnc) and Qualifications (Qlftns), followed by the group Management (Mngmnt) and Interest (Intrst), and finally, nearest the {E, SE} vertex is Growth (Grwth) exhibiting the least relevance in this analysis. In terms of the level of ambiguity in the evidence from these motivations, Qualifications, with the greatest distance between SE and E simplex coordinates has the least ambiguity in its evidence.

In more readable terms, the most influential motivation characteristics underpinning the application to study entrepreneurship education were the urge to achieve a qualification, desire to undertake a business start-up and increase self confidence. Less significance was awarded to the acquisition of managerial experience and to increase interest in the subject matter. Least significance was awarded to the issue of achieving business growth. Thus it was apparent that student responses were focusing on the short term obtainable characteristics with the completion and attainment of the qualification, increasing subject knowledge and confidence and thereafter the immediate prospect of business start-up. There was however minimal consideration of the concept of business growth to the entrepreneurship student which might have been considered as a longer term and hence more unobtainable objective of entrepreneurship study.

Further identification of the influence of the individual motivation responses is next given by demonstrating the direct association of the response given and the evidence it contributes to the classification of the students (item response to motivation BOE), see Figure 3 (these graphs are made up of a combination of the graphs A1a and A1b in Figure A1).

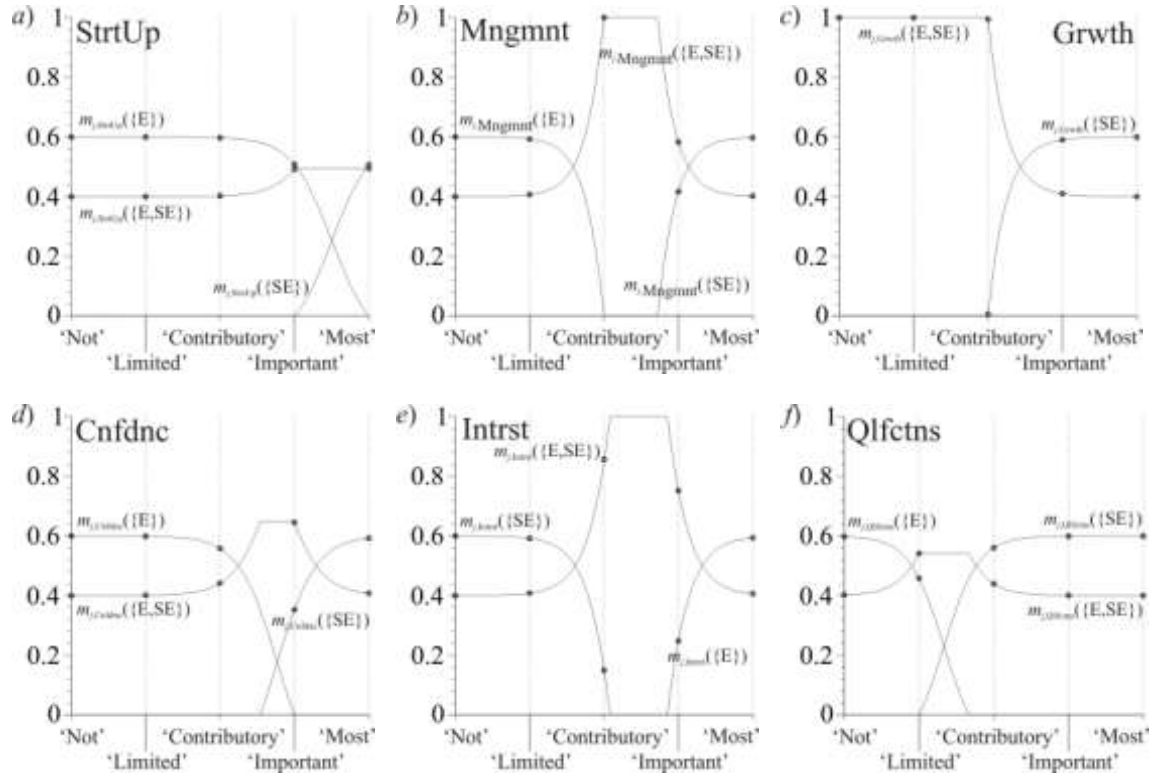


Figure 3: Direct relationship between response terms and mass values in motivation BOEs

In Figure 3, each graph shows 'upto' three mass values that make up a motivation BOE, which offer belief evidence to a student's aspirations being employment ($m_{j,StrtUp}({E})$ for example in Figure 3a for Start-Up motivation characteristic) or self-employment ($m_{j,StrtUp}({SE})$) and between these ignorance ($m_{j,StrtUp}({E, SE})$). These mass value lines are a direct consequence from merging the first two graphs in Figure A1 in Appendix A, which exposit the stages of motivation BOE constructed, prior to their representation in a simplex plot. Moreover, the points are the actual values associated with the Likert scale ('Not' - 1 to 'Most' - 5) values employed in this study, with the lines joining them showing the general structure of the mass values in each motivation BOE (over a continuous domain from 'Not' to 'Most').

Interpreted more qualitatively, referring to the Start-Up motivation characteristic (in Figure 3a), the CaRBS analysis suggests that a response from 'Not' upto 'Contributory' levels of motivation shows constant evidence towards the respondent having aspirations to being employed ($m_{j,StrtUp}({E})$), whereas, from 'Important' to 'Most' the evidence towards employment aspirations reduces, with an initial increase in ignorance ($m_{j,StrtUp}({E, SE})$) then evidence towards the respondent having aspirations to being self-employed ($m_{j,StrtUp}({SE})$). In summary, there appears to be a positive 'non-linear' relationship with increasing Start-Up motivation associated with increasing aspirations to being self-employed away from being employed. Students with a self employment aspiration were motivated predominantly by a business start-up characteristic. Whilst self explanatory, this provides confirmatory evidence of the positive relationship between an immediate entrepreneurial aspiration, via self employment and a business start-up characteristic.

Considering the other two most relevant motivation characteristics, Confidence (Cnfdnc - Figure 3d) and Qualifications (Qlfcnts - Figure 3f), in Figure 3d, a positive relationship is shown for the responses to the contribution of the Confidence motivation characteristic to a student's aspiration being self-employment (increased contribution resulting is reduced evidence towards employment and/or increased evidence towards self-employment). Similarly, in Figure 3f, there is a positive relationship shown for the responses to the contribution of the Qualification motivation characteristic to a student's aspiration to being self-employment.

These results show the non-linear facet of the analysis undertaken when using the CaRBS technique. That is, while a linear set of values were initially attached to the linguistic response values 'Not' to 'Most', the graphs in Figure 3 show the non-linear set of evidences they offer in this problem, for each motivation characteristic. A unique feature of the employment of CaRBS, is that, there can

exist only total ignorance in the evidence from some responses. For example, in Figure 3c (Grwth motivation), for the responses 'Not' to 'Contributory' there is only ignorant evidence from these response levels, meaning the responses at these levels were too ambiguous to both the self-employment and employment aspirations to enable any specific evidence from them.

6 Influence of Motivation Characteristics with other Demographics

This section furthers the exposition of the relevancies of the considered motivation characteristics in the aspirations of students to being self-employed or employed, but here, their relevance when taking into account certain demographics of the students are considered, namely, gender, age and work status. The prior literature suggested demographics such as age, gender and work status impact significantly upon entrepreneurial motivations and desire to undertake an effective business start-up. Therefore, it is a logical progression to investigate the relevance of such demographics against motivational characteristics of the desire to undertake entrepreneurial education. This analysis will inform the construction and provision of effective entrepreneurship education programmes based on understanding learning requirements of specific student types. The emphasis on the graphical elucidation of the demographic based relevancies continues here, in each of the three next presented subsections. Further, analysis is only undertaken on the three most relevant motivation characteristics (see Figure 2), namely Start-Up, Confidence and Qualifications.

Gender

This section examines the impact of gender on student entrepreneurial motivational characteristics contrasted against future employment aspirations. The literature has clearly highlighted variances in entrepreneurial uptake by gender. Therefore it is important to assess the variances in gender attitudes towards entrepreneurial education. Considering this gender demographic, Figure 4 shows a constellation breakdown of certain motivation characteristics.

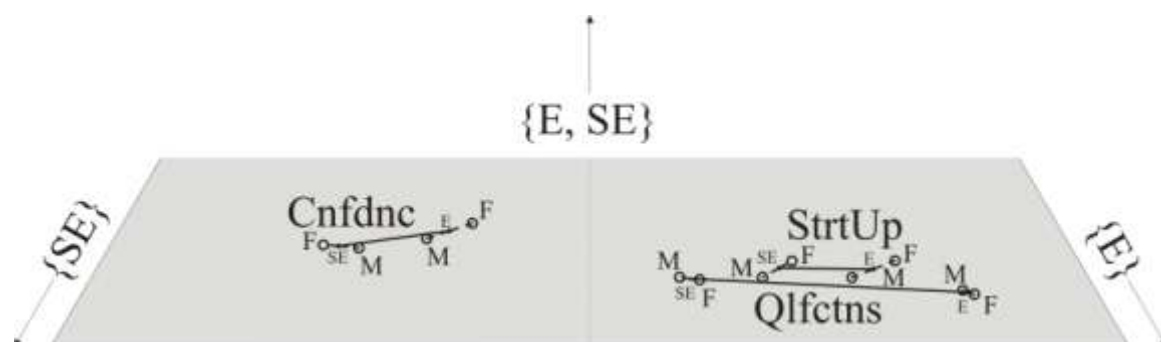


Figure 4: Simplex plot based elucidation of relevance of certain motivation characteristics to discernment of self-employment (SE) and employment (E) aspirations, with the added demographic of gender considered

The details presented in Figure 4, are described with reference to the Confidence (Cnfdnc) motivation characteristic. Near the base of the simplex plot sub-domain shown (to the left), the constellation breakdown is made up of the original solid line connecting the average motivation BOEs for students with employment (E) and self-employment (SE) aspirations (shown with small circles). From these small circles, there are four dashed lines, with respective 'end' circles that represent the average motivation BOEs for all male/female employment/self-employment aspiring respondents (labelled M and F appropriately).

The consideration here is, in what directions are the respective end circles (labelled M or F), in relation to the respective E or SE circle. For ease of explanation, the terms SE-M, SE-F, E-M and E-F represents these paths, for example, SE-M are male students with aspirations to self-employment, etc. For the Confidence motivation characteristic, in the case of those students with known employment aspirations, the female students (E-F), based on their motivation characteristic responses, were more associated with the employment aspiration than their male counterparts (the E-F path is nearer the {E} vertex than the E-M path). Similarly, those students with self-employment aspirations, the female students are more associated with the self-employment aspiration than their male counterparts (the SE-F path is nearer the {SE} vertex than the SE-M path). In both analyses (self employed and employed) it was apparent that female students were more interesting in acquiring increased confidence in the option of an entrepreneurial career than their male counterparts. This is

perhaps unsurprising as the literature suggested males have more confidence to undertake a business start than their female counterparts.

In the case of the Qualifications motivation characteristic, the differences of the E-F and E-M paths (and SE-F and SE-M) are less apart than in the case with the Confidence motivation characteristic, indicating not as noticeable differences between the genders on this motivation characteristic. This result suggests equality in motivation between genders.

Age

The annual GEM studies (e.g. Allen et al., 2007) identified differing levels of entrepreneurial activity by age with activity more prevalent in the 25-34 and 35-44 age groups, but less significant in the 18-24 grouping. It is essential that entrepreneurship education providers effectively target the 18-24 grouping to encourage further uptake of entrepreneurship education and thereafter business start-up activity. Considering this age demographic, Figure 5 shows a constellation breakdown of certain motivation characteristics.



Figure 5: Simplex plot based elucidation of relevance of certain motivation characteristics to discernment of self-employment (SE) and employment (E) aspirations, with the added demographic of age considered (1 - '18-24', 2 - '25-34', 3 - '35-44', 4 - '45-54' and 5 - '55-64')

From Figure 5, considering the confidence motivation (Cnfdnc), for those students with self-employment aspirations, there is a general trend of the older the student (in age groups 3, 4 and 5 - described in Figure 1), being more associated with the self-employment aspiration than the younger aged students (in age groups 1 and 2). That is, for Cnfdnc, the simplex coordinates SE-3, SE-4 and SE5 are nearer the {SE} vertex than the SE-1 and SE-2. The argument surrounding this evidence, is that, the older age groupings, students over the age of 35, might demonstrate more self confidence in the opportunity offered by self-employment based on their prior working and life experiences. Similar, inference can be gauged from inspection of the other constellations presented in Figure 5.

Work Status

Work status will examine the existing work status of individual students (for example full or part time education, unemployed, self employed or homemaker classified) and whether there were any associations with motivational characteristics and employment aspiration. Considering this work status demographic, Figure 6 shows a constellation breakdown of certain motivation characteristics.

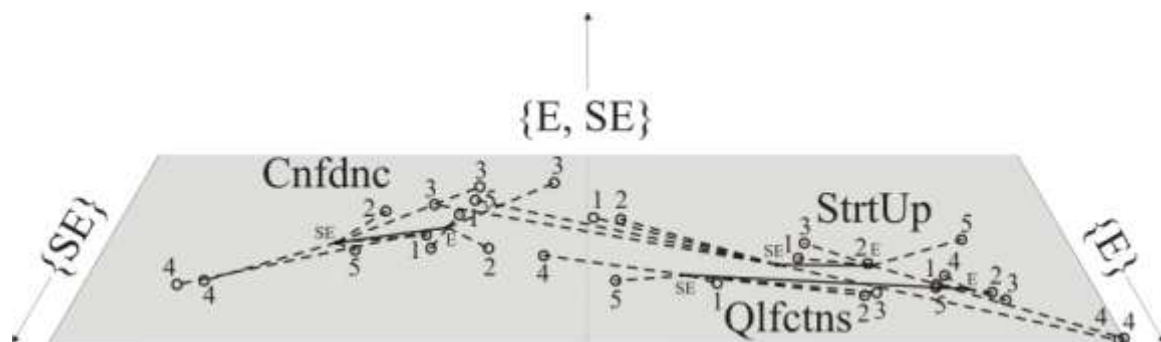


Figure 6: Simplex plot based elucidation of relevance of certain motivation characteristics to discernment of self-employment (SE) and employment (E) aspirations, with the added

demographic of work status considered (1 - 'Full-time', 2 - 'Part-time', 3 - 'Unemployed', 4 - 'Self-employed' and 5 - 'Homemaker')

From Figure 6, again considering the confidence motivation (Cnfdnc), for those students with self-employment aspirations, there is clear evidence that those students whose work statuses are currently self-employed have significant associated with the self-employment aspiration (see SE-4). However, it appears the same is true for those students who current work-status is employed (see E-4). Similar, inference can be gauged from inspection of the other constellations presented in Figure 6.

7 Conclusions

This study has presented a unique evaluation of student motivations to undertake an entrepreneurship education programme using the novel CaRBS data mining technique. The analysis revealed that the key motivators to entrepreneurship education in this instance were (in the discerning of student with employment and self-employment aspirations):

- i) Desire to achieve a qualification.
- ii) Desire to undertake a business start-up.
- iii) Desire to increase confidence in the option of an entrepreneurial career.

These results confirm the findings of Young (1997) and Galloway and Brown (2002) in that students pursue entrepreneurial education programmes to acquire additional skills and knowledge, independence and increased confidence through an entrepreneurial career. Less prevalence was awarded to the desire to develop interest in the subject matter or the need to acquire managerial experience. This conflicts somewhat with the views posited by DeTienne and Chandler (2004) and Politis (2005) that entrepreneurial education programmes provide the opportunity to develop subject knowledge. The least significant motivational characteristic was identified as the desire to undertake an entrepreneurial education programme to achieve business growth. This result suggests that students did not value the significance of business growth as an important consideration when contemplating an entrepreneurial qualification.

From these results, it appears that entrepreneurial education students give greater significance to issues of more immediate significance to them like achieving the qualification, building confidence and thereafter achieving a business start-up. If such attitudes were to be maintained beyond the business start-up phase then there may be a danger that these Owner/Managers may not pursue a growth strategy and simply remain constant in size. It is essential that such a mindset is avoided and young nascent Owner/Managers informed regarding the importance of a strategic mindset.

Beyond the general results of the significance of particular motivation characteristics, the CaRBS technique has allowed some inference to be gauged on different cohorts of students, namely using their, gender, age and work-status demographics. For example, in the case of the gender demographic, in particular with regard to confidence, levels of difference were noticed in the relationships between the levels of motivations of male and female students and the self-employment or employment aspirations.

The motivations for entrepreneurial activity previously identified by Roberts (1991) and Segal et al., (2005) as need to achieve, desire for independence, dissatisfaction with current employment bear direct comparison with the motivations for entrepreneurial education, for example desire for independence and self improvement with the obvious exception of desire to achieve qualifications.

In terms of the future utilisation of the employed CaRBS technique, in the area entrepreneurial education, it could potentially inform entrepreneurship education providers an understanding of the learning requirements of individual students. As way of an example, customized programmes of studies could be constructed, which may offer more specialised focuses, such as on Confidence and/or Start-Up (two motivation characteristics found here to be important in discerning those students with self-employment and employment aspirations). For the entrepreneurship education providers, it could potentially the selection of more entrepreneurially oriented individuals.

Appendix A

This appendix outlines the rudiments of the CaRBS technique used in this study (Beynon, 2005a, 2005b). When used as a classification tool, it undertakes the predicted classification of objects (students here) based on a number of characteristics (question responses on agencies' understanding to their training needs).

The rudiments of CaRBS are based on Dempster-Shafer theory (Dempster, 1968; Shafer, 1976), the evidence from a characteristic value is quantified in a body of evidence (BOE), denoted by $m(\cdot)$, where all assigned mass values sum to unity. Moreover, for a student o_j ($1 \leq j \leq n_o$) and their i^{th} characteristic motivation value c_i ($1 \leq i \leq n_c$), a *motivation* BOE defined $m_{j,i}(\cdot)$, has mass values $m_{j,i}(\{x\})$ and $m_{j,i}(\{\neg x\})$, which denote levels of exact belief in the classification of a student to a hypothesis x (self-employment aspiration) and not the hypothesis $\neg x$ (employment aspiration), and $m_{j,i}(\{x, \neg x\})$ the level of concomitant ignorance. Following Safranek *et al.* (1990), they are given by:

$$m_{j,i}(\{x\}) = \max(0, \frac{B_i}{1-A_i} cf_i(v) - \frac{A_i B_i}{1-A_i}), m_{j,i}(\{\neg x\}) = \max(0, \frac{-B_i}{1-A_i} cf_i(v) + B_i)$$

$$\text{and } m_{j,i}(\{x, \neg x\}) = 1 - m_{j,i}(\{x\}) - m_{j,i}(\{\neg x\}),$$

where $cf_i(v) = \frac{1}{1 + e^{-k_i(v-\theta_i)}}$, and k_i , θ_i , A_i and B_i are incumbent control variables. Figure 1 presents the progression from a value v to a motivation BOE and its representation as a simplex coordinate in a simplex plot.

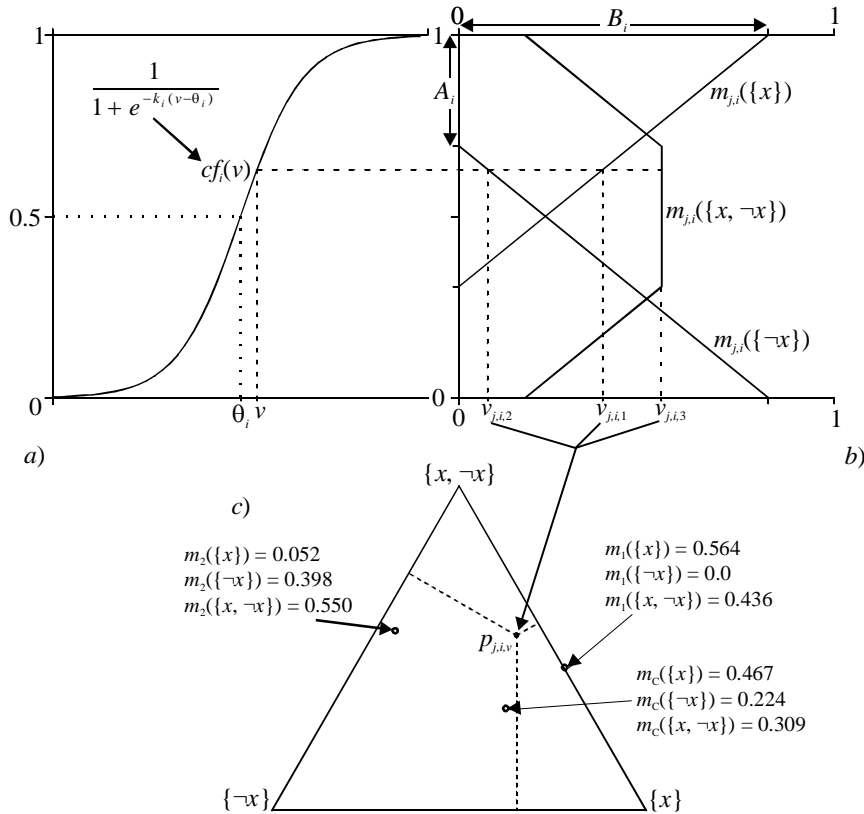


Figure A1. Graphical representation of stages in CaRBS for a single characteristic motivation value.

In Figure 1, a question response value v is first transformed into a confidence value (1a), from which it is de-constructed into its motivation BOE (1b), made up of a triplet of mass values $m_{j,i}(\{x\})$, $m_{j,i}(\{\neg x\})$ and $m_{j,i}(\{x, \neg x\})$. Stage (1c) shows a BOE $m_{j,i}(\cdot)$; $m_{j,i}(\{x\}) = v_{j,i,1}$, $m_{j,i}(\{\neg x\}) = v_{j,i,2}$ and $m_{j,i}(\{x, \neg x\}) = v_{j,i,3}$ can be represented as a simplex coordinate ($p_{j,i,v}$) in a simplex plot (equilateral triangle), such that the least distance from $p_{j,i,v}$ to each of the sides of the equilateral triangle are in the same proportion (ratio) to the values $v_{j,i,1}$, $v_{j,i,2}$ and $v_{j,i,3}$.

The set of motivation BOEs $\{m_{j,i}(\cdot), i = 1, \dots, n_c\}$ associated with the business o_j can be combined using Dempster's combination rule into an *aspiration* BOE, defined $m_j(\cdot)$. Moreover, using $m_{j,i}(\cdot)$ and $m_{j,k}(\cdot)$ as two independent motivation BOEs, $[m_{j,i} \oplus m_{j,k}](\cdot)$ defines their combination, given by:

$$\begin{aligned}
[m_{j,i} \oplus m_{j,k}](\{x\}) &= \frac{m_{j,i}(\{x\})m_{j,k}(\{x\}) + m_{j,k}(\{x\})m_{j,i}(\{x, -x\}) + m_{j,i}(\{x\})m_{j,k}(\{x, -x\})}{1 - (m_{j,i}(\{-x\})m_{j,k}(\{x\}) + m_{j,i}(\{x\})m_{j,k}(\{-x\}))}, \\
[m_{j,i} \oplus m_{j,k}](\{-x\}) &= \frac{m_{j,i}(\{-x\})m_{j,k}(\{-x\}) + m_{j,k}(\{x, -x\})m_{j,i}(\{-x\}) + m_{j,k}(\{-x\})m_{j,i}(\{x, -x\})}{1 - (m_{j,i}(\{-x\})m_{j,k}(\{x\}) + m_{j,i}(\{x\})m_{j,k}(\{-x\}))}, \\
[m_{j,i} \oplus m_{j,k}](\{x, -x\}) &= 1 - [m_{j,i} \oplus m_{j,k}](\{x\}) - [m_{j,i} \oplus m_{j,k}](\{-x\}).
\end{aligned}$$

This process is then used iteratively to combine the motivation BOEs into an aspiration BOE. For a student o_j , its aspiration BOE contains the information necessary for its final classification (to self-employment or employment aspiration). To illustrate the method of combination employed here, in Figure 1c, the combination of two example BOEs, $m_1(\cdot)$ and $m_2(\cdot)$, is shown graphically in a simplex plot to a new BOE denoted $m_C(\cdot)$.

The configuration of a CarBS system depends on the assignment of values to the incumbent control variables (k_i , θ_i , A_i and B_i , $i = 1, \dots, n_C$). With the question responses labelled 0 to 3 and then standardised, the domains of the control variables are set as; $-3 \leq k_i \leq 3$, $-2 \leq \theta_i \leq 2$, $0 \leq A_i < 1$ and $B_i = 0.6$ (see Beynon, 2005b). With closed domains of the control variables this becomes a constrained optimisation problem, solved here using an evolutionary algorithm called Trigonometric Differential Evolution (Fan and Lampinen, 2003), with operation parameters; amplification control $F = 0.99$, crossover constant $CR = 0.85$, trigonometric mutation probability $M_t = 0.05$ and number of parameter vectors $NP = 10 \times \text{number of control variables} = 180$.

Associated with any evolutionary algorithm is an objective function (OB), here a positive function that measures the misclassification of students from their known defined categorized aspiration (self-employment or employment). The equivalence classes $E(x)$ and $E(-x)$ are sets of objects known to be classified to $\{x\}$ and $\{-x\}$, respectively. For objects in $E(x)$ and $E(-x)$, the optimum solution is to maximize the weighted difference values $(m_j(\{x\}) - m_j(\{-x\}))$ and $(m_j(\{-x\}) - m_j(\{x\}))$, respectively. The subsequent OB is given by:

$$\frac{1}{4} \left(\frac{1}{|E(x)|} \sum_{o_j \in E(x)} (1 - m_j(\{x\}) + m_j(\{-x\})) + \frac{1}{|E(-x)|} \sum_{o_j \in E(-x)} (1 + m_j(\{x\}) - m_j(\{-x\})) \right).$$

which has the range $0 \leq OB \leq 1$. Maximizing a difference value such as $(m_j(\{x\}) - m_j(\{-x\}))$ only indirectly affects the associated ignorance, rather than making it a direct issue, since the OB does not incorporate the respective $m_j(\{x, -x\})$ mass values. The division of elements of OB by $|E(\cdot)|$ takes account for unbalanced data sets, in this case with different numbers of students to the two aspirations of self-employment and employment.

An indication of the evidential support offered by each question to the known self-employment and employment aspiring students is made with the evaluation of *average motivation* BOEs. More formally, for those students in an equivalence classes $E(\cdot)$, the average *motivation* BOEs, defined $am_{i,\cdot}(\cdot)$, is given by:

$$am_{i,\cdot}(\{x\}) = \sum_{o_j \in E(\cdot)} \frac{m_{j,i}(\{x\})}{|E(\cdot)|}, \quad am_{i,\cdot}(\{-x\}) = \sum_{o_j \in E(\cdot)} \frac{m_{j,i}(\{-x\})}{|E(\cdot)|}, \quad am_{i,\cdot}(\{x, -x\}) = \sum_{o_j \in E(\cdot)} \frac{m_{j,i}(\{x, -x\})}{|E(\cdot)|}$$

where o_j is a student As BOEs they can be represented as simplex coordinates in a simplex plot describing the evidential support of a motivation based question to the aspiration of the students.

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